**A Crash Course in Comets**

Comets are remains from the cold, outer areas of our solar system. They are thought to come from two areas - the Oort Cloud and the Kuiper Belt. In both of these are areas, materials left over from the formation of our solar system have condensed into icy objects. Both the Kuiper Belt and Oort Cloud are far beyond the last planet, Neptune. They are even farther out than the orbit of Pluto.

Even though comets start so far away, they don’t always stay there. Some comets break away and start to orbit our sun like planets. Unlike planets, which have very round orbits, comet orbits are highly elliptical. This means they get very close to the sun and then go very far away.

Different comets take different amounts of time to orbit the sun. Short period comets orbit the Sun every 20 years or less. Comet Encke (the one we are after in our mission) orbits the sun every 3.3 years. Long period comets orbit the Sun every 200 years or longer. Comet Hale-Bopp will not appear again for another 2,400 years. Comets with orbits in between are called Halley-type comets, named after comet Halley which orbits the sun every 75-76 years.

Comets have three parts: the nucleus, the coma and the tails. The nucleus is the solid center part.   
It is made of ice, frozen carbon dioxide gas (dry ice) and rocky debris. As the comet gets closer to the sun, the coma starts to form. As the ice and frozen carbon dioxide start to melt, a gas and dust layer forms that surrounds the nucleus. This layer is called the coma.

As the comet gets even closer to the sun, the tails form. The tails are also made of gas and dust. They are made when energy from the Sun blows the coma backwards. The tails are very long and can extend millions of miles through space. Since the energy from the Sun blows the gas and dust backwards, the tails always point away from the Sun.

Comets actually have two tails, the dust tail and the ion tail. We see a comet's coma and dust tail because sunlight reflects off the dust. The ion tails can also be seen because the energy from the Sun excites some molecules in the gas and dust so that they have a bluish glow.

Scientists study comets for many reasons. Since they are made of “leftovers” from when the solar system formed, studying them helps us to figure out how our solar system was made. Another reason to study comets is that we know a comet could hit the Earth. Although the chances of this happening is very, very, small it is important to understand the nature of comets so we can design better methods to protect ourselves from them should one be on a collision path with Earth.

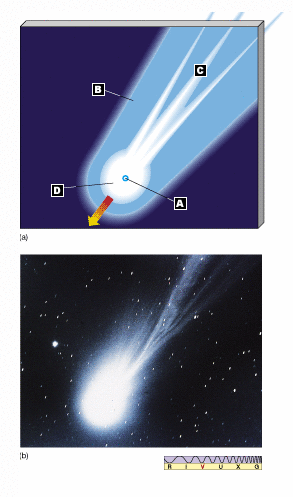
Probably the most famous comet is Halley’s comet. It was named after a famous astronomer, Edmund Halley, who first calculated when it would return. Comet Hale-Bopp (named after the first 2 people to discover it) holds the record for the longest time we could see it in the sky; an astonishing 19 months. Finally, Comet Shoemaker-Levy (again named after its discoverers) collided into the planet Jupiter. It was the first collision of two solar system bodies ever to be recorded. The impact created huge columns of gas and left scars on Jupiter’s surface.

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**A Crash Course in Comets**

1. What regions of the solar system do comets come from?
2. How are the orbits of comets different from the orbits of planets?

1. What is the difference between a short period comet and a long period comet?
2. What are the 3 parts of a comet?

1. When and how do comets form tails?
2. Why do scientists want to study comets?
3. How are comets named?
4. Look at the pictures of a comet.   
   Label: **nucleus, coma, dust tail, ion tail**.
5. Which part of the comet do you think we should try to capture particles from and why?
6. Why are the other 2 parts NOT good places to try to capture particles from?